

**King Saud University**  
**College of Engineering**  
**Industrial Engineering Department**

Manufacturing Process I, IE252 and IE351, Mid Term Exam. #1

Date: Tue 26/Oct/2010

Time: 60 Min

**Student Name:** \_\_\_\_\_

**ID:** \_\_\_\_\_

**Question 1:**

**6 MARKS**

- a) Morphological process model; cover material flow, information flow and energy flow. State three types of material flows and give one process example for each?
- b) Explain what we mean by technological properties of materials.
- c) What is the main difference between nominal and true stresses, drive the relationship between them?
- d) What we mean by plain-strain conditions in metal forming processes?
- e) What we mean by strain hardening of metals in metal forming?

**Question 2:**

**7 Marks**

The following data were reported from tension test:

Load (N)	11500	16400	17000	20900	20600
Elongation (mm)	0.5	5.0	15.0	21.5	25.5

The specimen has wire gauge length of 50.5 mm and wire gauge diameter of 8 mm. Determine:

- a) The cross-section area at maximum load?
- b) The true stress at maximum load?
- c) The ultimate tensile strength?
- d) The strain hardening exponent  $n$  and strength coefficient  $K$  ?
- e) The ideal plastic work required to stretch the specimen to instability?

**Question 3:**

**7 Marks**

A rolling mill with single stand used to decrease the strip height from  $h_f$  to  $h_o$ . Roll diameter is 500 mm (i.e.  $R=250$  mm), and driven at angular speed of  $n=50$  rpm. Given roll width or strip width  $w=1800$  mm, calculates;

- a) Rolling force from  $h_o=2.5$  mm to  $h_f=2.0$  mm and the power required.
- b) Rolling force from  $h_o=2.5$  mm to  $h_f=2.0$  mm and the power required when rolling speed increased to 100 rpm.
- c) Comment on your results.

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